Development and Characterization of Thermal Compression Flip-Chip Bonding Process

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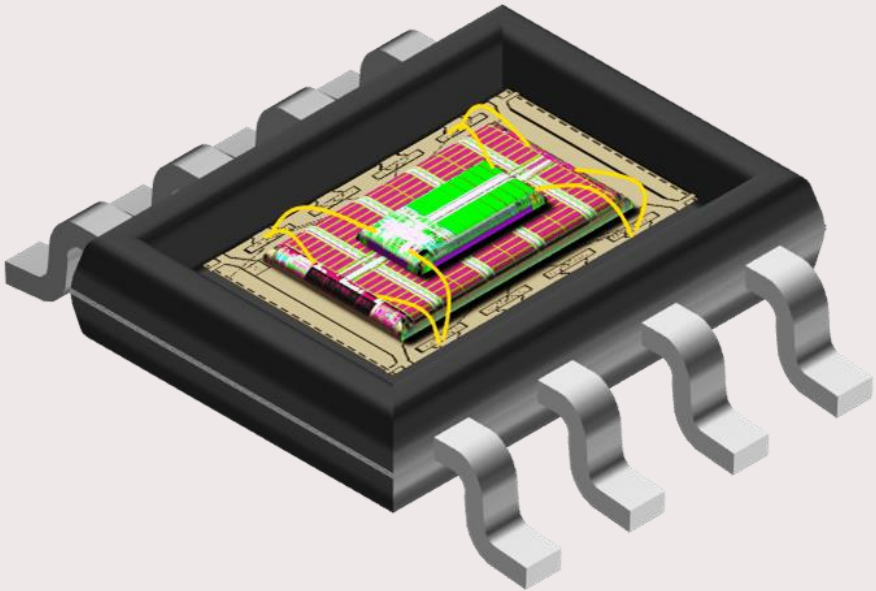
Applications of the project

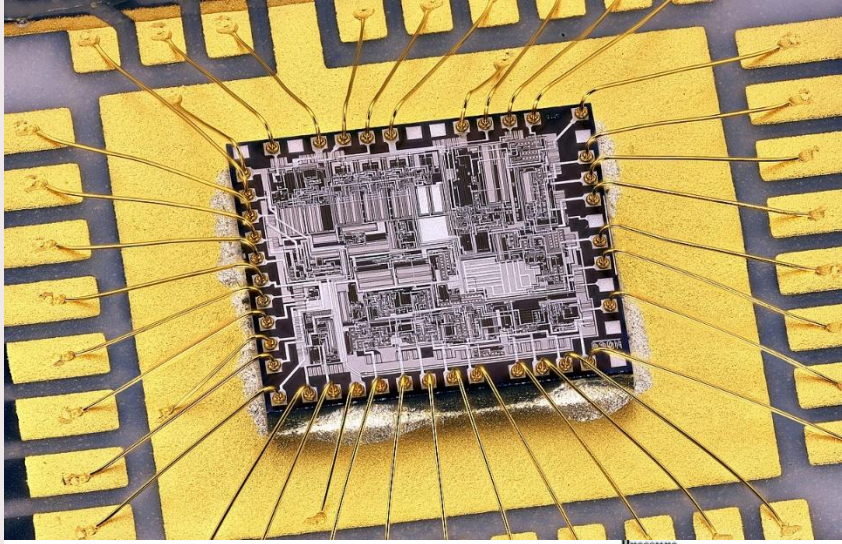
- High-tech applications
  - Speed increasingly important
  - Hardware limitations
- More and faster connections required
- Packaging

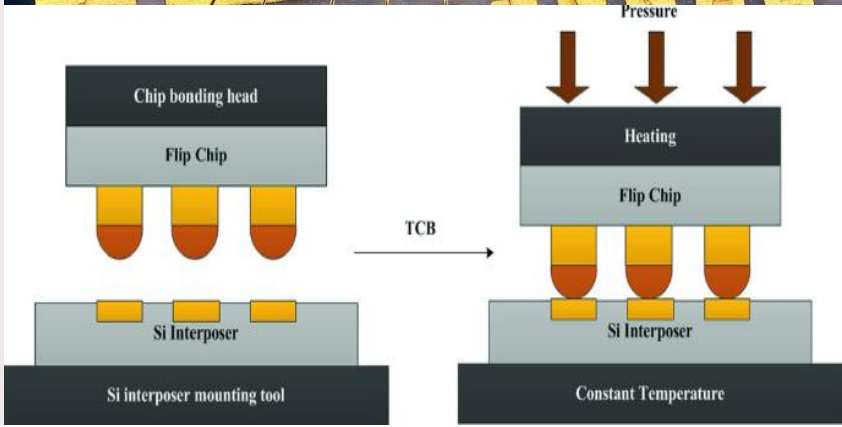


Purpose of the project

- Flip-Chip Technology vs Wire Bonding
- More interconnections
- Shorter interconnections
- Lower propagation time

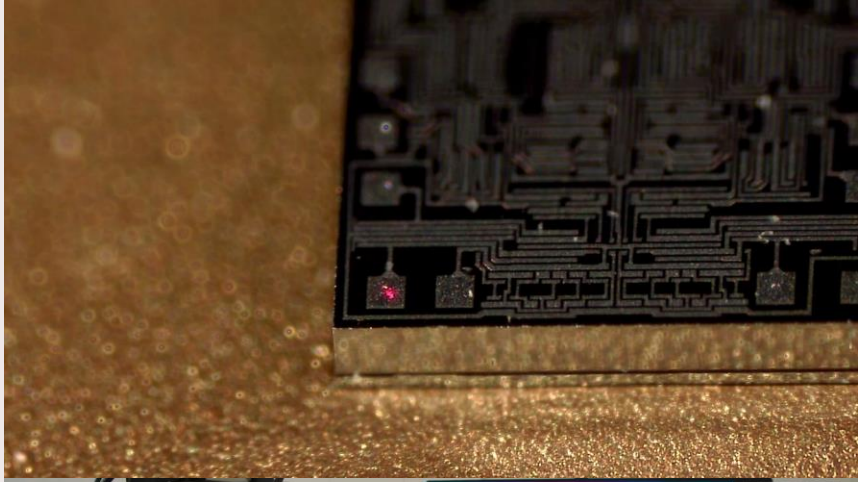
- Process existence benefits TU/e projects requiring FCT

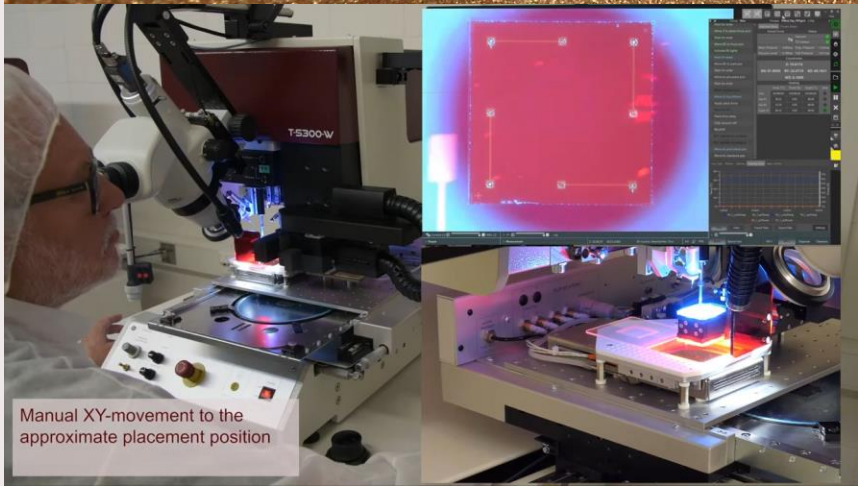




Project setup

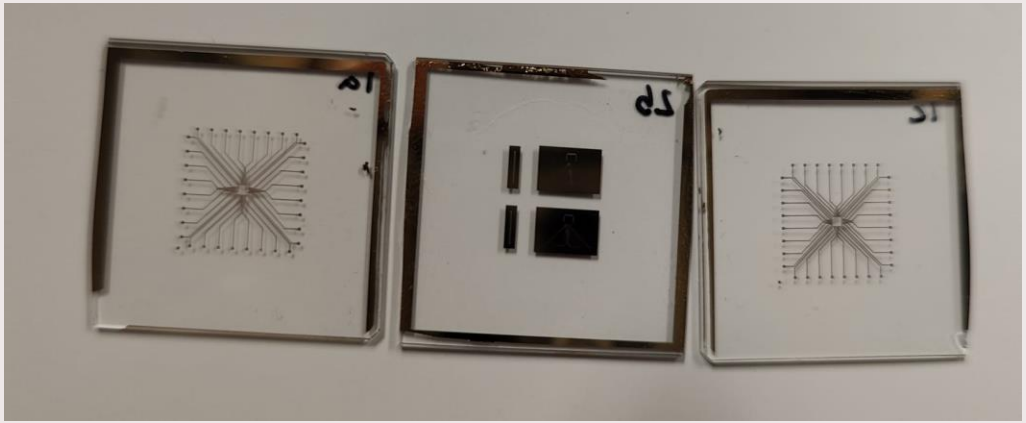
- Proposed process: 4 stages
  - Interposer design & production
  - Bump placement
  - Die placement
  - Testing
- Developed for IC group
  - Cleanroom
  - Electronics lab

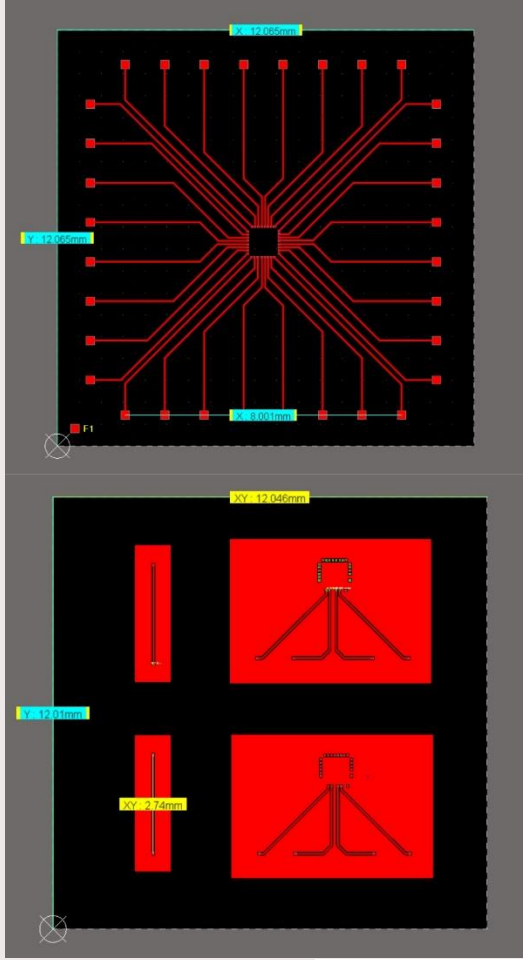




Process developments: Interposer Design

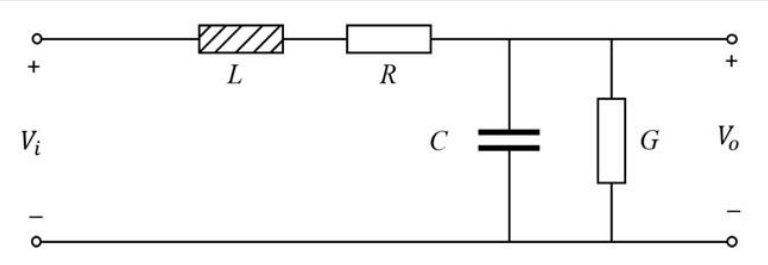
- Glass interposer
- 2 metallization methods: sputtering and evaporation
- 2 purposes: trade-off and characteristics

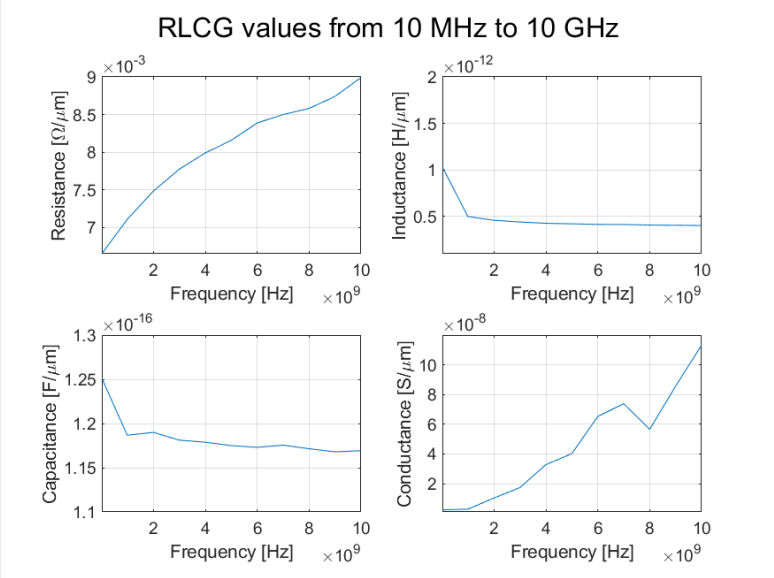




Process developments: Interposer Characterization

- 50 nm Titanium adhesion layer
- Evaporation: lower resistance, consistent bump placement





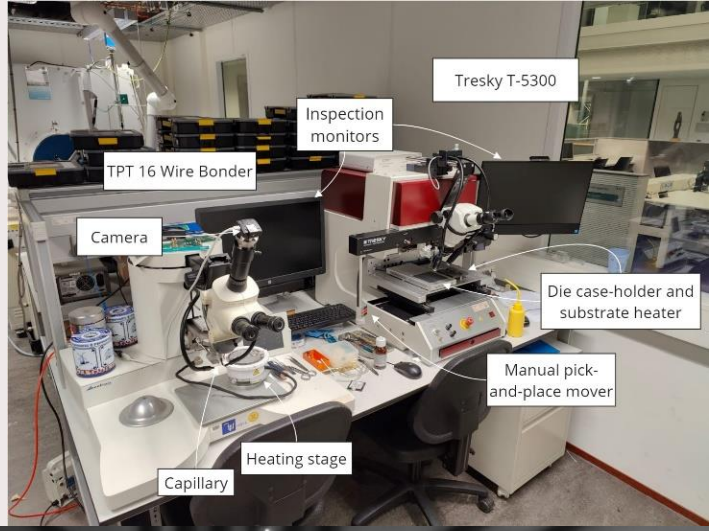
Process developments: Bumps

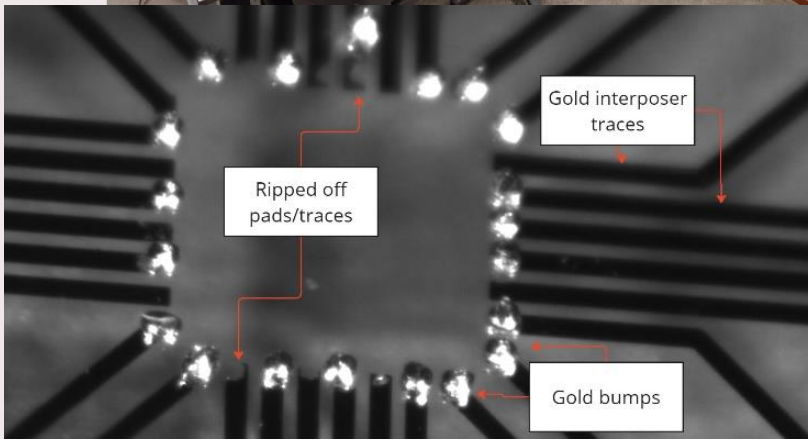
- 25 vs 17 um gold wire

- Good bump quality on small gold surface areas, but bad on large areas
- Reliable process
- Requires pad pitch > 90 um

- Good bump quality on small gold surface areas, but bad on large areas
- Unreliable process - clogging
- 90 um pad pitch works

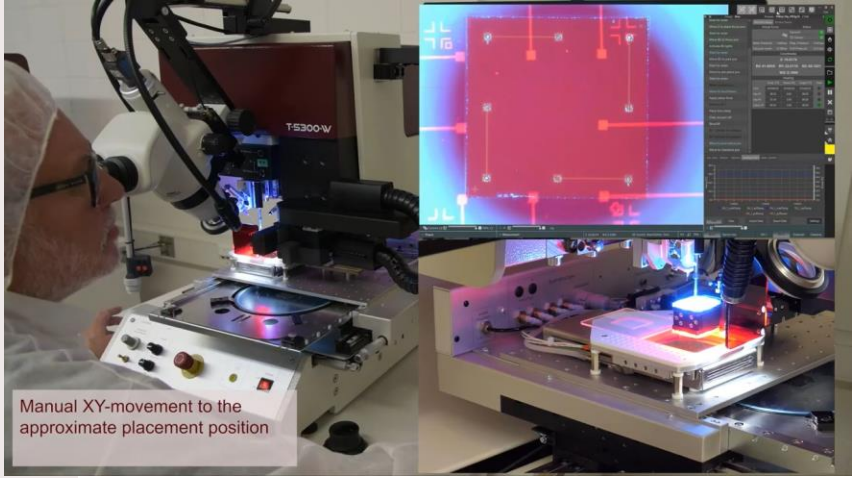
- Placement method: cursor as reference

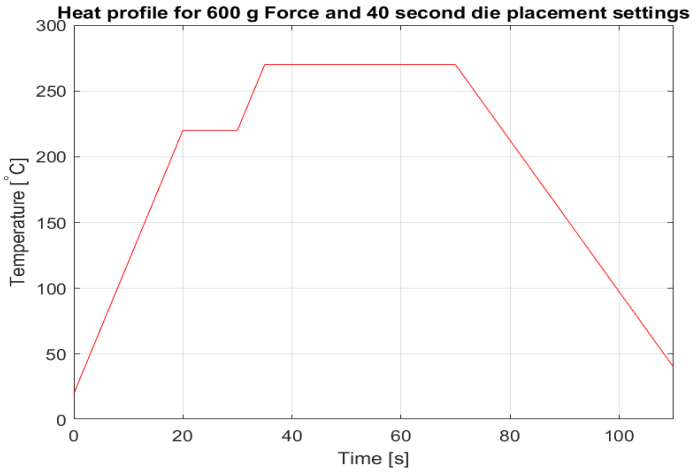




Process developments: Dies

- Heat profile, force and duration settings required
- Semi-successful attempt
- Weight distribution
- Metal connections confirmed





Final remarks

- Cooperation with Accelonix recommended
- Evaporation preferred production method
- 25 um gold wire process most reliable, but requires pad pitch size > 90 um
- Future research steps:

1. Improving and optimizing settings for bump and die placement
2. Investigate AC behaviour of tracks at frequencies >> 10 GHz
3. Exploring electrical characteristics of the bumps


Questions?